The Indus-Yarlung Zangbo ophiolite belt: A Mariana arc-backarc system analog

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Current investigation of the 2500+ km long Indus-Yarlung Zangbo Suture Zone (IYZSZ) has shown that it is very complex in terms of geochronology and metamorphic and igneous history. Two ophiolite sub-groups are recognized within the IYZSZ. Sub-group 1 is Mid- to Late Jurassic (150-177 Ma) in age and ill-defined because only few sequences have been found and studied so far. Sub-group 1 is probably derived from the destruction of a marginal basin comprising intra-oceanic arc and fore-arc settings. Spontang and Zedong sequences are examples of this sub-group. Sub-group 2 is Lower Cretaceous (120-130 Ma) and represents the destruction of a marginal basin comprising an arc-back-arc system. These ophiolites are spatially associated with ophiolitic mélanges and flysch respectively representing the reworking of the Cretaceous ophiolites and Indian continental margin and the Neo-Tethyan ocean floor. Most ophiolitic sequences belong to Lower Cretaceous sub-group such as Xiugubagu, Saga, Xigaze, etc... Amphibolite and garnet amphibolite blocks (123-130 Ma) found within the ophiolitic mélange share similar geochemical attributes with sub-group 2 ophiolites. Their protoliths were probably generated within back-arc spreading center and metamorphosed in a nascent subduction zone at depth around 50 km. Some younger radiometric ages suggest events at 80 and 90 Ma which could represent the entry of Indian continental margin into the intra-oceanic subduction zone and/or obduction of ophiolites. However these ages seem to be very rare throughout the whole suture zone and are therefore considered as resulting from local metamorphic events.

IYZSZ ophiolites reveal geochemical features related to the interplay between India and Eurasian plates once separated by the large Tethys Ocean and associated smaller basins such as the Neo-Tethys marginal sea. We present series of geochemical diagrams showing the diversity of geodynamic settings for ophiolite massifs and related ophiolitic mélanges. We conclude that ophiolites are fragments of arc and backarc features which were assembled in a way similar to modern Mariana arc-backarc system. Ba/Ta, Th/Nb, Nb/Yb ratios and normalized multielement diagrams illustrate various crustal-derived material input into mantle sources as a result of evolution of supra-subduction zone factory. Tectonically associated OIB-type magmatic rocks should not be ascribed to ophiolite sequences because they result from a Lower Cretaceous plume which was active within Neo-Tethys basin. We propose a time-framed model for development and partial destruction of the Mariana-type system (Figure 1).

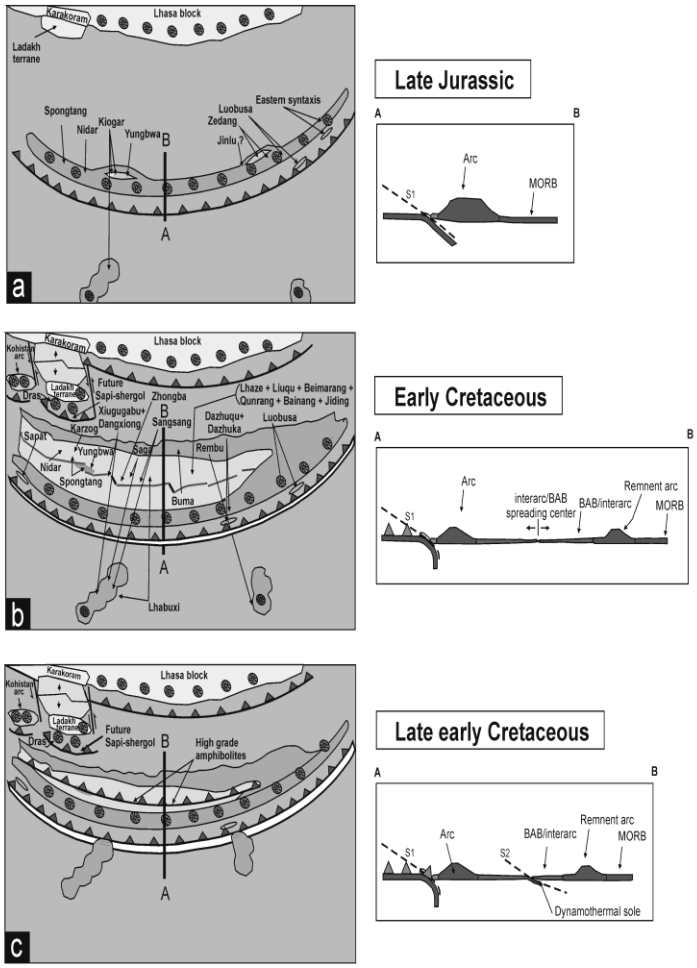

Figure 1. . Schematic reconstructions of the Neo-Tethys basin for the Jurassic and Cretaceous times. This model is based on rock geochemical affinities and available ages. Most ophiolites were formed in the Mariana-type intraoceanic suprasubduction zone developing over a hypothetic north-dipping subduction zone. OIB-related sequences could be associated with a hotspot.